Raw milk intake: beware of emerging brucellosis

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Abstract

Brucellosis is a challenging zoonosis to diagnose and treat. The recent outbreaks of \textit{Brucella abortus} RB51 in several states in the United States, including New Jersey and Texas, due to raw milk consumption has raised the concern of drug-resistant \textit{Brucella} \textit{spp}. This commentary highlights the importance of being on the lookout for this emerging infection.

Brucellosis remains a rare zoonosis in the United States, with only 120 cases per annum being reported to the Centers for Diseases Control and Prevention (CDC), and those mainly by California, Texas, Arizona and Florida (56.55 % of the cases) [1]. \textit{Brucella melitensis} and \textit{Brucella abortus} constitute the majority (~75 %) of these reported cases [1]. Most of these cases are associated with the consumption of unpasteurized dairy products while travelling to places where brucellosis is endemic in animals, e.g. the Mediterranean Basin, South America, Africa, Eastern Europe and the Middle East [1]. The remainder of the US brucellosis cases (~25 %) are caused by \textit{Brucella suis}, which is diagnosed in hunted and slaughtered feral swine through contact with blood and fluids from infected swine or dogs [1]. Dogs are the source of another \textit{Brucella} species: \textit{Brucella canis}, which is rare and less pathogenic in humans. Although cases are very rare, \textit{B. abortus} RB51, which is used to vaccinate cattle has been associated with needle-stick exposures in veterinarians while vaccinating cattle [1–3]. In 2017, two cases of \textit{B. abortus} RB51 reported to the CDC were related to raw milk consumption in New Jersey [4]. Additionally, other cases of human \textit{B. abortus} RB51 infections linked to K-Bar raw milk consumption between 1 June and 7 August 2017, were reported in several states, including Texas, Tennessee, North Dakota, Ohio, California, Arkansas and Alabama [5, 6]. Although highly effective in controlling \textit{B. abortus} in cattle, the calfhood vaccination unexpectedly stayed alive in the bloodstream of two out of 48 cows, which were unable to clear the RB51 vaccination strain shed into their milk at the K-Bar dairy in Paradise, Texas [4, 5].

Patients with acute \textit{B. abortus} RB51 infection present with fever, sweats, generalized fatigue and body aches. If not treated, they may develop long-term complications, e.g. hepato-splenomegaly, arthritis, myocarditis and, in rare cases, meningitis and/or orchitis. \textit{B. abortus} RB51 can lead to miscarriages in pregnant women [1, 5, 6].

It is important to identify which \textit{Brucella} species is the disease causative agent for epidemiological and therapeutic purposes. Molecular testing plays a major role in the diagnosis of brucellosis [1, 4]. For instance, matrix-assisted laser desorption/ionization time of flight (MALDI-TOF) mass spectrometry was shown to be a reliable technique to identify the main human pathogenic \textit{Brucella} \textit{spp}, including \textit{B. melitensis}, \textit{B. abortus}, \textit{B. canis} and \textit{B. suis} [7]. Real-time polymerase chain reaction (PCR) is a decent tool for diagnosing \textit{Brucella} \textit{spp} from human blood and serum specimens, with a specificity of 100 % and a sensitivity range from 79 % (for serum specimens) to 99.2 % (for whole-blood and serum specimens combined) [8]. Zerva \textit{et al} demonstrated that serum was better than whole blood for diagnosing human brucellosis by PCR [9]. A PCR-based luminex bead-based suspension array showed promising results and high specificity in rapidly detecting eight species of \textit{Brucella} in 3 to 4 h in dairy products [10]. Similarly, real-time PCR assays showed 100 % specificity while testing \textit{Brucella} \textit{spp} from non-clinical specimens [11]. In addition to bacterial isolation, serological tests, e.g. the \textit{Brucella} micro-agglutination test, can detect antibodies to \textit{B. abortus}, \textit{B. melitensis} or \textit{B. suis}, but not \textit{B. canis} and the \textit{B. abortus} RB51 strain [12].

Antimicrobial therapy should be started promptly once the diagnosis of brucellosis has been confirmed to prevent chronic infection. However, one should be aware that the \textit{B. abortus} RB51 strain is resistant to rifampin, which should not be used for this particular infection [4]. Thus, if exposure to \textit{B. abortus} RB51 is suspected, a 21-day course of
doxycycline and trimethoprim/sulfamethoxazole is recommended as post-exposure prophylaxis [5, 6].

In conclusion, *B. abortus* RB51 should be looked for if patients present with brucellosis symptoms and report the intake of unpasteurized dairy products to avoid long-term complications. Moreover, public awareness and counselling about the risk of brucellosis and raw milk intake are warranted to contain this life-threatening emerging infection.

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**References**